

CLAIMS

1. A binding resin particularly for manufacturing articles, characterized in that it comprises the following components:

5 (A) a powder that comprises silica and one or more hardening agents; and

(B) a solution of at least one silicate of an alkaline metal.

2. The binding resin according to claim 1, characterized in that it further comprises at least one of the following optional ingredients:

10 (C) a powder comprising at least one pozzolanic inorganic binding agent;

(D) a powder comprising at least one pozzolanic binding agent with large specific surface area;

(E) a solution comprising at least one waterproofer;

15 (F) a powder comprising refractory clay comprising aluminum silicate;

(G) a powder comprising at least one water-repellent agent in solid form.

3. The binding resin according to claim 1, characterized in that it comprises at least one element for each one of the following groups:

20 Group (1): (A) a powder comprising silica and one or more hardening agents;

Group (2): (B) a solution of at least one silicate of an alkaline metal;

Group (3):

25 Group (4): -- (C) a powder comprising at least one pozzolanic inorganic binding agent;

-- (D) a powder comprising at least one pozzolanic binding agent with large specific surface area; and

-- (E) a solution comprising at least one waterproofer;

Group (4): (F) a powder comprising refractory clay comprising

aluminum silicate; and

Group (5): (G) a powder comprising at least one water-repellent agent in solid form.

4. The binding resin according to claim 2, characterized in that it
5 comprises all the ingredients (A) to (G).

5. The binding resin according to claim 1, characterized in that it comprises the following components:

10 (A) a powder comprising silica and one or more hardening agents in an amount comprised between 15 and 85% by weight on the final weight of the mixture; and

(B) a solution of at least one silicate of an alkaline metal in an amount comprised between 15 and 85% by weight on the final weight of the mixture.

15 6. The binding agent according to claim 2, characterized in that it further comprises at least one of the following optional ingredients:

(C) a powder comprising at least one pozzolanic inorganic binding agent in an amount comprised between 4 and 10% by weight on the final weight of the mixture;

20 (D) a powder comprising at least one pozzolanic binding agent with high specific surface area, in an amount comprised between 5 and 15% by weight on the final weight of the mixture;

(E) a solution comprising at least one waterproofer in an amount comprised between 1 and 2% by weight on the final weight of the mixture;

25 (F) a powder comprising refractory clay, comprising aluminum silicate in an amount comprised between 5 and 40% by weight on the final weight of the mixture;

(G) a powder comprising at least one water-repellent agent in solid form in an amount comprised between 0.1 and 1% by weight on the final weight of the mixture.

30 7. The binding resin according to claim 1, characterized in that

component (A) comprises 10 to 99.9% by weight of silica in powder form, mixed with an amount comprised between 0.1 and 20% by weight on the total of the powder of at least one hardening agent.

8. The binding resin according to claim 1, characterized in that the 5 hardening agent is selected from the group that comprises polyhydroxyl alcohol esters and alkylene carbonate esters.

9. The binding resin according to claim 1, characterized in that in component (B) the solution is an aqueous solution.

10. The binding resin according to claim 1, characterized in that in 10 component (B) said alkaline metal is selected from the group that comprises sodium, potassium and a mixture thereof.

11. The binding resin according to claims 9 and 10, characterized in that the aqueous solution of alkaline metal silicate has a weight ratio between SiO_2 and Na_2O comprised between 1.5:1 and 4.0:1 or a weight ratio 15 between SiO_2 and K_2O comprised between 1.5:1 and 4.0:1.

12. The binding resin according to claim 2, characterized in that component (C) comprises at least one blast furnace slag.

13. The binding resin according to claim 12, characterized in that said 20 blast furnace slag comprises calcium oxides in an amount of approximately 40% by weight, silica in an amount of approximately 30% by weight, and alumina in an amount of approximately 10% by weight, the quantities being variable according to the source material from which the slag is derived.

14. The binding resin according to claim 2, characterized in that component (D) is constituted by condensed silica fume.

25 15. The binding resin according to claim 14, characterized in that the condensed silica fume is an amorphous powder with spheroidal granules, a bulk density comprised in the range of $0.60 \pm 0.02 \text{ kg/l}$, and a specific surface area equal to, or greater than, $15 \text{ m}^2/\text{g}$.

30 16. The binding resin according to claim 2, characterized in that the waterproofer in component (E) is constituted by a solution of at least one

alkylsiliconate.

17. The binding resin according to claim 16, wherein said solution is an aqueous solution.

18. The binding resin according to claim 16, wherein said alkylsiliconate is present in an amount comprised between 1 and 3% by weight on the total weight of the mixture.

19. The binding resin according to claim 16, wherein said alkylsiliconate is potassium methylsiliconate.

20. The binding resin according to claim 2, characterized in that the solid water-repellent agent in ingredient (G) is constituted by at least one alkyl alkoxy siloxane.

21. A method for producing a binding resin particularly for manufacturing articles, characterized in that it comprises the step of mixing a powder that comprises silica and one or more hardening agents with a solution of at least one silicate of an alkaline metal.

22. The method according to claim 21, characterized in that it comprises the additional steps of mixing ingredients (A) and (B) with at least one of the optional ingredients selected from the group that consists of (C), (D), (E), (F), and (G).

23. The method according to claim 22, characterized in that the solid ingredient (A) is mixed separately with all the optional solid components that are present and are selected from the group that consists of ingredients (C), (D) and (G) and mixtures thereof, in that the liquid component (B) is mixed separately with the other optional liquid component (F) if present, and the solid and liquid components are mixed together at a later time.

24. The method according to claims 22 and 23, characterized in that component (G), if present, is the first of the solid ingredients to be mixed with (A).

25. The method according to one of claims 22 to 24, characterized in that it comprises the steps of:

(a) mixing a powder comprising silica and one or more hardening agents with a powder comprising at least one water-repellent agent in solid form;

(a1) mixing the product of step (a) with a powder comprising at least 5 one pozzolanic inorganic binding agent;

(a2) mixing the product of step (a1) with a powder comprising at least one pozzolanic binding agent with high specific surface area;

(a3) mixing the product of step (a2) with a powder comprising refractory clay that comprises aluminum silicate;

10 (b) mixing a solution of at least one silicate of an alkaline metal with a solution that comprises at least one waterproofer; and

(c) mixing the product of step (a3) with the product of step (b).

26. The method according to any one of claims 21 to 25, characterized in that it comprises the steps of:

15 (d) mixing the binding resin obtained with a method according to any one of claims 21 to 25 with at least one inert material;

(e) pouring the mixture obtained from step (d) into a mold or form;

(f) allowing the product to cure.

27. The method according to any one of claims 21 to 26, 20 characterized in that the inert material is used in an amount between 10 and 70% by weight.

28. The method according to claim 21, characterized in that the inert material is selected from the group that comprises pumice, perlite, expanded clay (of various particle sizes), vermiculite, polystyrene, straw, cork, kenaf, 25 sawdust and wood derivatives (for example paper and cardboard), plastics and its derivatives, polyurethane (in any physical aspect or formulation thereof), aluminum, iron and metallic alloys, glass and its derivatives, rock, lava lapilli, carbon fiber, natural and/or synthetic fibers, textile fibers, metallic fibers, and mixtures thereof.

30 29. The method according to claim 26, characterized in that mixing

step (d) lasts 5 minutes to 3 hours.

30. The method according to claim 26, characterized in that step (f) for curing the product lasts 5 minutes to 40 days.

31. The method according to claim 30, characterized in that step (f) for curing the product lasts 20 to 40 days if performed in natural conditions.

32. The method according to claim 30, characterized in that the step (f) for curing the product lasts 5 to 10 days if performed in a heated environment (dryer) with hot air at a temperature comprised between 40 and 70 °C.

10 33. The method according to claim 30, characterized in that step (f) for curing the product lasts 10 to 30 minutes and more if performed in an autoclave at high pressure.

15 34. The method according to claim 30, characterized in that the step (f) for curing the product lasts 5 to 20 minutes and more if it is performed with microwave technologies.

35. The method according to claim 26, characterized in that the product curing step (f) is performed in the presence of CO₂ at 25 °C, applied under pressure for a time that can vary from 5 to 30 minutes.

36. A product manufactured starting from a binding resin according 20 to any one of claims 1 to 20.

37. The product according to the method of any one of claims 21 to 35.

38. The product according to claims 36 and 37, characterized in that it further comprises internally a reinforcement constituted by at least one 25 element selected among metallic nets, plastic nets, synthetic fibers and materials conventionally used to improve the strength characteristics of the article.

39. Use of the invention according to any one of claims 1 to 35 to manufacture an article for one or more sectors selected from the group that 30 comprises the building, naval, aeronautical and transportation sectors.

40. The use according to claim 39, characterized in that the field of use comprises one or more technical applications selected from the group that comprises the insulation of roofs, the manufacture of raised floors, the provision of mechanical parts having particular characteristics, the provision 5 of components for motors, the manufacture of partitions and expendable walls, the erection of buildings, the manufacture of flameproof barriers for doors and bulkheads for vehicles and watercraft, the manufacture of thermally insulating panels in refrigeration and conditioning systems, the manufacture of refrigeration cells, the manufacture of insulating claddings 10 and the like, and the manufacture of soundproofing panels.